

Publication	Volume	Date	Authors	Title
<i>ChemRxiv</i>	doi: 10.26434/chemrxiv.7367708.v1	Nov. 2018	Laura Marvin, Wynter Paiva, Nicole Gill, Marissa A. Morales, Jeffrey Mark Halpern, James Vesenka, Eva Rose Balog	Flow Imaging Microscopy as a Novel Tool for High-Throughput Evaluation of Elastin-like Polymer Coacervates
<i>Journal of Pharmaceutical Sciences</i>	doi: 10.1016/j.xphs.2018.08.006	Aug. 2018	Masato Kiyoshi, Hiroko Shibata, Akira Harazono, Tetsuo Torisu, Takahiro Maruno, Michiko Akimaru, Yuuka Asano, Mai Kiokawa, Keisuke Ikemoto, Yukari Itakura, Takafumi Iwura, Aya Kikitsu, Takashi Kumagai, Naoki Mori, Hiroaki Murase, Hirotaka Nishimura, Atsushi Oda, Taiichiro Ogawa, Akiko Ishii-Watabe	Collaborative Study For Analysis of Subvisible Particles Using Flow Imaging And Light Obscuration: Experiences in Japanese Biopharmaceutical Consortium
<i>Fuel</i>	doi: 10.1016/j.fuel.2018.07.064	Jul. 2018	Xianhua Feng, Daniel Fakunle, Keith Osness, Greg Khan, Larry Sartori	Oil in water characterization by dynamic optical fluid imaging technology
<i>Biotechnology and Bioengineering</i>	doi: 10.1002/bit.26746	Jun. 2018	Daniel G. Greene, Steven J. Traylor, Jing Guo, Leila H. Choe, Shannon Modla, Xuankuo Xu, Nripen Singh, Lye Lin Lock, Sanchayita Ghose, Zheng Jian Li, Kelvin H. Lee, Norman J. Wagner, Abraham M. Lenhoff	Mechanisms of precipitate formation during the purification of an Fc-fusion protein
<i>BioProcess International</i>	Vol. 16 (5)	May 2018	Kevin Mattison, Jonathan Mehtala, Maria Taddei, Jessica Cheung, Hiten Gutka	Rational design of liquid protein formulations: Application of biophysical stability predictors and descriptors to reformulate biotherapeutics
<i>Scientific Reports</i>	doi: 10.1038/s41598-018-24336-9	Apr. 2018	Tengfei Fan, Jae Hyeon Park, Quynh Anh Pham, Ee-Lin Tan, Raghavendra C. Mundargi, Michael G. Potroz, Haram Jung, Nam-Joon Cho	Extraction of cage-like sporopollenin exine capsules from dandelion pollen grains
<i>Journal of Pharmaceutical Sciences</i>	doi: 10.1016/j.xphs.2018.01.015	Jan. 2018	Austin L. Daniels, Theodore W. Randolph	Flow Microscopy Imaging Is Sensitive to Characteristics of Subvisible Particles in Peginesatide Formulations Associated with Severe Adverse Reactions
<i>Journal of Pharmaceutical Sciences</i>	doi: 10.1016/j.xphs.2017.12.008	Dec. 2017	Christopher P. Calderon, Austin L. Daniels, Theodore W. Randolph	Deep Convolutional Neural Network Analysis of Flow Imaging Microscopy Data to Classify Subvisible Particles in Protein Formulations
<i>Journal of Industrial and Engineering Chemistry</i>	doi: 10.1016/j.jiec.2017.12.023	Dec. 2017	Michael K. Corliss, Chuan Kiat Bok, Jurriaan Gillissen, Michael G. Potroz, Haram Jung, Ee-Lin Tan, Raghavendra C. Mundargi, Nam-Joon Cho	Preserving the Inflated Structure of Lyophilized Sporopollenin Exine Capsules with Polyethylene Glycol Osmolyte
<i>Advanced Functional Materials</i>	doi: 10.1002/advfm.201702338	Jul. 2017	Hong Wang, Michael G. Potroz, Joshua A. Jackman, Bahareh Khezri, Tijana Marić, Nam-Joon Cho, Martin Pumera	Bioinspired Spiky Micromotors Based on Sporopollenin Exine Capsules
<i>Advanced Functional Materials</i>	doi: 10.1002/advfm.201700270	Jun. 2017	Michael G. Potroz, Raghavendra C. Mundargi, Jurriaan J. Gillissen, Ee-Lin Tan, Sigalit Meker, Jae H. Park, Haram Jung, Soohyun Park, Daeho Cho, Sa-Ik Bang, Nam-Joon Cho	Plant-Based Hollow Microcapsules for oral Delivery Applications: Toward Optimized Loading and Controlled Release

<i>Journal of Industrial and Engineering Chemistry</i>	doi: 10.1016/j.jiec.2017.05.009	May 2017	Arun Kumar Prabhakar, Hui Ying Lai, Michael G. Potroz, Michael K. Corliss, Jae Hyeon Park, Raghavendra C. Mundargi, Daeho Cho, Sa-Ik Bang, Nam-Joon Cho	Chemical processing strategies to obtain sporopollenin exine capsules from multi compartmental pine pollen
<i>Pharmaceutical Research</i>	doi: 0.1007/s11095-017-2120-8	Feb. 2017	A.S. Sediq, S.K.D. Waasdorp, M.R. Nejadnik, M.M.C van Beers, J. Meulenaar, R. Verrijck, W. Jiskoot	Determination of the Porosity of PLGA Microparticles by Tracking Their Sedimentation Velocity Using a Flow Imaging Microscope (FlowCAM)
<i>Pharmaceutical Research</i>	doi: 10.1007/s11095-016-2079-x	Dec. 2016	Miguel Saggu, Ankit R. Patel, Theodoro Koulis	A Random Forest Approach for Counting Silicone Oil Droplets and Protein Particles in Antibody Formulations Using Flow Microscopy
<i>Advanced Functional Materials</i>	doi: 10.1002/adfm.201603550	Nov. 2016	Lili Wang, Joshua A. Jackman, Wei Beng Ng, Nam-Joon Cho	Flexible, Graphene-Coated Biocomposite for Highly Sensitive, Real-Time Molecular Detection
<i>Materials Science and Engineering C</i>	doi: 10.1016/j.msec.2016.07.002	Jul. 2016	Anderson J. Bonon, Marcus Weck, Estevam A. Bonfante, Paulo G. Coelho	Physicochemical characterization of three fiber-reinforced epoxide-based composites for dental applications
<i>Journal of Pharmaceutical Sciences</i>	doi: 10.1016/j.xphs.2016.03.044	Jun. 2016	Anacelia Ríos Quiroz, Christof Finkler, Joerg Huwyler, Hanns-Christian Mahler, Roland Schmidt, Atanas V. Koulov	Factors Governing the Accuracy of Subvisible Particle Counting Methods
<i>Nature: Scientific Reports</i>	doi: 10.1038/srep28017	Jun. 2016	Jae Hyeon Park, Jeongeun Seo, Joshua A. Jackman, Nam-Joon Cho	Inflated Sporopollenin Exine Capsules Obtained from Thin-Walled Pollen
<i>Chem Nano Mat</i>	doi: 10.1002/cnma.201600004	Mar. 2016	Jeongeun Seo, Lili Wang, WeiBeng Ng, Nam-Joon Cho	Preparation of Highly Monodisperse Electroactive Pollen Biocomposites
<i>Journal of Pharmaceutical Sciences</i>	doi: 10.1016/S0022-3549(15)00180-X	Mar. 2016	Joseph Kotarek, Christine Stuart, Silvia H. De Paoli, Jan Simak, Tsai-Lien Lin, Yamei Gao, Mikhail Ovanosov, Yideng Liang, Dorothy Scott, Janice Brown, Yun Bai, Dean D. Metcalfe, Ewa Marszal, Jack A. Ragheb	Subvisible Particle Content, Formulation and Dose of an Erythropoietin Peptide Mimetic Product are Associated with Severe Adverse Post marketing Events
<i>Journal of Pharmaceutical Sciences</i>	doi: 10.1016/j.xphs.2016.02.019	Feb. 2016	Carly Fleagle Chisholm, Abby E. Baker, Kaitlin R. Soucie, Raul M. Torres, John F. Carpenter, Theodore W. Randolph	Silicone Oil Microdroplets Can Induce Antibody Responses Against Recombinant Murine Growth Hormone in Mice
<i>Journal of Industrial and Engineering Chemistry</i>	doi: 10.1016/j.jiec.2016.01.022	Feb. 2016	Raghavendra C. Mundargi, Ee-Lin Tan, Jeongeun Seo, Nam-Joon Cho	Encapsulation and controlled release formulations of 5-fluorouracil from natural Lycopodium clavatum spores
<i>PLOS One</i>	doi: 10.1371/journal.pone.0150229	Feb. 2016	Grant E. Frahm, Alex W. T. Pochopsky, Tessa M. Clarke, Michael J. W. Johnston	Evaluation of Microflow Digital Imaging Particle Analysis for Sub-Visible Particles Formulated with an Opaque Vaccine Adjuvant

<i>Royal Society of Chemistry Advances</i>	doi: 10.1039/c5ra27207f	Feb. 2016	Raghavendra C. Mundargi, Michael G. Potroz, Jae Hyeon Park, Jeongeun Seo, Jae Ho Lee, Nam-Joon Cho	Extraction of sporopollenin exine capsules from sunflower pollen grains
<i>Nature: Scientific Reports</i>	doi: 10.1038/srep19960	Jan. 2016	Raghavendra C. Mundargi, Michael G. Potroz, Jae Hyeon Park, Jeongeun Seo, Ee-Lin Tan, Jae Ho Lee, Nam-Joon Cho	Eco-friendly streamlined process for sporopollenin exine capsule extraction
<i>Advanced Functional Materials</i>	doi: 10.1002/advfm.201504940	Jan. 2016	Lili Wang, WeiBeng Ng, Joshua A. Jackman, Nam-Joon Cho	Graphene-Functionalized Natural Microcapsules: Modular Building Blocks for Ultrahigh Sensitivity Bioelectronic Platforms
<i>Advanced Functional Materials</i>	doi: 10.1002/advfm.201502322	Jan. 2016	Raghavendra C. Mundargi, Michael G. Potroz, Soohyun Park, Jae Hyeon Park, Hitomi Shirahama, Jae Ho Lee, Jeongeun Seo, Nam-Joon Cho	Raghavendra C. Mundargi, Michael G. Potroz, Soohyun Park, Jae Hyeon Park, Hitomi Shirahama, Jae Ho Lee, Jeongeun Seo, Nam-Joon Cho
<i>European Journal of Pharmaceutical Sciences</i>	doi: 10.1016/j.ejps.2015.11.012	Nov. 2015	Gene Merutka, Brian M. Murphy, Robert W. Payne, Glenn A. Wilson, James E. Matsuura, Charles S. Henry, Mark Cornell Manning	Stability of Lyophilized Teriparatide, PTH (1-34), after reconstitution
<i>Small Journal</i>	doi: 10.1002/smll.201500860	Oct. 2015	Raghavendra C. Mundargi, Michael G. Potroz, Soohyun Park, Hitomi Shirahama, Jae Ho Lee, Jeongeun Seo, Nam-Joon Cho	Natural Sunflower Pollen as a Drug Delivery Vehicle
<i>Biologicals</i>	doi: 10.1016/j.biologics.2015.07.011	Jul. 2015	V. Corvari, L. O. Narhi, T.M. Spitznagel, N. Afonina, S. Cao, P. Cash, I. Cecchini, M.R. DeFelippis, P. Garidel, A. Herre, A.V. Koulov, T. Lubiniecki, H.-C. Mahler, P. Mangiagalli, D. Nesta, B. Perez-Ramirez, A. Polozova, M. Rossi, R. Schmidt, R. Simler, S. Singh, A. Weiskopf, K. Wuchner	Subvisible (2-100 µm) particle analysis during biotherapeutic drug product development: Part 2, experience with the application of subvisible particle analysis.
<i>Journal of Pharmaceutical Sciences</i>	doi: 10.1002/jps.24550	Jun. 2015	Inna Levin, Shiri Zigman, Arthuer Komlosch, Juergen Kettenring	Development of Flow Imaging Analysis for Subvisible Particle Characterization in Glatiramer Acetate
<i>Pharmaceutical Technology</i>	Vol. 39, Issue 11, pg 38-42	Apr. 2015	Carol Rea Flynn, Dan McNerney, Palak Shah	Identifying Causes of Delamination
<i>Pharmaceutical Technology</i>	Vol. 39, Issue 1	Jan. 2015	Adeline Siew	Analyzing Protein Aggregation in Biopharmaceuticals
<i>European Journal of Pharmaceutics and Biopharmaceutics</i>	doi: 10.1016/j.ejpb.2013.03.029	Oct. 2014	Hassett KJ, Cousins MC, Rabia LA, Chadwick CM, O'Hara JM, Nandi P, Brey RN, Mantis NJ, Carpenter JF	Stabilization of recombinant ricin toxin A subunit vaccine through lyophilization
<i>Journal of Pharmaceutical Sciences</i>	doi: 10.1002/jps.24184	Sep. 2014	Elena Krayukhina, Kouhei Tsumoto, Susumu Uchiyama, Kiichi Fukui	Effects of Syringe Material and Silicone oil Lubrication on the Stability of Pharmaceutical Proteins
<i>Journal of Pharmaceutical Sciences</i>	doi: 10.1002/jps.23973	Jun. 2014	Alana Gerhardt, Nicole R. McGraw, Daniel K. Schwartz, Jared S. Bee, John F. Carpenter, Theodore W. Randolph	Protein Aggregation and Particle Formation in Prefilled Glass Syringes

<i>Natural Products and Bioprospecting</i>	doi: 10.1007/s13659-014-0004-8	Feb. 2014	Heisler J., Elvir L., Barnouti F., Charles E., Wolkow T.D., and R. Pyati	Morphological Effects of Natural Products in Schizosaccharomyces pombe Measured by Imaging Flow Cytometry
<i>European Journal of Pharmaceutical Sciences</i>	doi: 10.1016/j.ejps.2013.12.014	Dec. 2013	Tobias Werk, David B. Volkin, Hanns-Christian Mahler	Effect of Solution Properties on the Counting and Sizing of Subvisible Particle Standards as Measured by Light Obscuration and Digital Imaging Methods
<i>Pharmaceutical Biotechnology</i>	doi: 10.1002/jps.23786	Nov.2013	Jesper Sondergaard Pederson, Malin Persson	Unmasking Translucent Protein Particles by Improved Micro-Flow Imaging Algorithms
<i>AAPS Journal</i>	doi: 10.1208/s12248-013-9522-2	Aug. 2013	Sarah Zöls, Daniel Weinbuch, Michael Wiggenhorn, Gerhard Winter, Wolfgang Friess, Wim Jiskoot, Andrea Hawe	Flow Imaging Microscopy for Protein Particle Analysis - A comparative Evaluation of Four Different Analytical Instruments
<i>Journal of Pharmaceutical Sciences</i>	doi: 10.1002/jps.23445	Jan. 2013	Glenn A. Wilson, Mark Cornell Manning	Flow Imaging: Moving Toward Best Practices for Subvisible Particle Quantification in Protein Products
<i>Analytical Chemistry</i>	doi: 10.1021/ac300976g	Jul. 2012	Patel AR, Lau D, Liu J	Quantification and Characterization of Micrometer and Submicrometer Subvisible Particles in Protein Therapeutics by Use of a Suspended Microchannel Resonator
<i>World Environmental and Water Resources Congress 2010</i>	doi: 10.1061/41114(371)379	Apr. 2012	Osei K, Brown L, Andoh R, Gwinn A	An Innovative and Rapid Method of Assessing Particle Shape and Size in Stormwater Runoff
<i>Journal of Encapsulation and Adsorption Sciences</i>	doi: 10.4236/jeas.2012.21001	Mar. 2012	Kouassi GK, Teriveedhi VK, Milby CL, Ahmad T, Boley MS, Gowda NM, Terry RJ	Nano-Microencapsulation and Controlled Release of Linoleic Acid in Biopolymer Matrices: Effects of the Physical State, Water Activity, and Quercetin on Oxidative Stability
<i>Journal of Pharmaceutical Sciences</i>	doi: 10.1002/jps.23001	Mar. 2012	Zöls S, Tantipolphan R, Wiggenhorn M, Winter G, Jiskoot W, Friess W, Hawe A	Particles in Therapeutic Protein Formulations, Part 1: Overview of Analytical Methods
<i>Genetic Engineering and Biotechnology News</i>	doi: 10.1089/gen.32.3.13.	Feb. 2012	Beltzer J	Measuring and Characterizing Protein Aggregates
<i>Chemi Ingenieur Technik</i>	doi: 10.1002/cite.201100195	Feb. 2012	Wenda N, Woehlecke H, Detloff T, Lerche D	Design of Particulate Systems by Variation of the Characteristics of Biogenic Particles
<i>University of Kansas Master's Thesis</i>		Dec. 2011	Tobias Frommknecht	Comparisons of Two Different Analytical Methodologies for the Characterization of Sub-Visible Particles in Therapeutic Protein Formulations
<i>Pharmaceutical Research</i>	doi: 10.1007/s1095-001-0590-7	Sep. 2011	René Strehl, Verena Rombach-Riegraf, Manuel Diez, Kamal Egodage, Markus Bluemel, Margit Jeschke, Atanas V. Koulov	Discrimination Between Silicone Oil Droplets and Protein Aggregates in Biopharmaceuticals: A Novel Multiparametric Image Filter for Sub-visible Particles in Microflow Imaging Analysis

<i>International Journal of Condition Monitoring</i>	doi: 10.1784/2047 64211798089 057	Jun. 2011	Vähäoja PO, Pikkarainen HVS	Trends in industrial oil analysis- a review
<i>Journal of Yeast and Fungal Research</i>	Vol. 2(7) pp. 106-112	Aug. 2011	Pyati R, Elvir LL, Charles EC, Seenath U, Wolkow TD	Imaging flow cytometric analysis of Schizosaccharomyces pombe morphology
<i>BioPharm International</i>		Aug. 2011	Lew Brown	Characterizing Biologics Using Dynamic Imaging Particle Analysis
<i>TMS Light Metals</i>	Vol. 2008 p. 875	Jan. 2008	Bowers R, Ningileri S, Palmund DC, Vitthus B, Cannova F	New Analytical Methods to Determine Calcined Coke Porosity, Shape, and Size
<i>Drug Discovery & Development</i>	Vol. 14 No. 5		Gregory J. Morrone, Wasfi Al-Azzam	An Imaging particle Analyzer Can Give Researchers a Better Picture of Particles in Parenteral Formulations
<i>Center for Pharmaceutical Biotechnology, Dept Chemical & Biological Engineering, Univ of Colorado</i>			Austin Daniels, Nathaniel Maddux, Theodore Randolph	Comparison of Flow-Imaging Microscopy Protein Aggregate Imaging Data Using Kullback-Leibler Divergence
<i>Coriolis Pharma</i>			Daniel Weinbuch, Sarah Zolls, Michael Wiggenhorn, Gerhard Winter, Wolfgang FrieSS, Wim Jiskoot, Andrea Hawe	Differentiation of Protein Particles and Silicone Oil Droplets by Flow-Imaging Microscopy (MFI and FlowCam) and Resonant Mass Measurement (Archimedes)
<i>National Institute of Standards and Technology</i>			Michael J. Carrier, Richard E. Cavicchi, Dean C. Ripple, Joshua R. Wayment	Development of Standards for the Optical Detection of Protein Particles
<i>National Institute of Standards and Technology</i>			R.E. Cavicchi, Cayla Collett, Srivalli Telikepalli, Dean C. Ripple	Variable Threshold Method for Determining the Boundaries of Imaged Subvisible Particles
<i>Particle Characterization Laboratories, Inc.</i>			William Bernt	Screening Biopharmaceuticals with Flow Imaging; Finding the Missing Fraction
		2011	Elise Schiltz, Erwin Freund, John F. Carpenter, Theodore W. Randolph	Shock-Induced Protein Aggregation and Particle Formation
			Lew Brown, William Bernt	A Comparison of Methods for Quantifying Silicone Droplets in Biologics Using Dynamic Imaging Particle Analysis
			Mark C. Manning, Glenn A. Wilson, Lew Brown,	Flow Imaging of Subvisible Protein Particles: Moving Towards Best Practices
			Lew Brown	The Importance of Image Quality in Quantifying Protein Aggregation Using Imaging Particle Analysis
Poster Event	Date	Authors	Poster Title	
Colorado Protein Stability Conference	2017	Bethany Brown, Michelle Devoe, Jeal Paul Habumugisha, Kathryn Roache-Johnson, Benjamin Spaulding, Heather Anne Wright	Comparison of Manual Pipetting vs. Automated Liquid Handler Pipetting into FlowCam 8100	
Colorado Protein Stability Conference	2017	Richard Cavicchi	Measurement of aggregate density by sedimentation measurement	
Colorado Protein Stability Conference	2017	Carly Chisholm	Primary container effects of particle formation in therapeutic protein formulations	
Colorado Protein Stability Conference	2017	Austin Daniels	Comparing populations of subvisible particles in protein therapeutics using flow-imaging microscopy and the Kullback-Leibler Divergence	
Colorado Protein Stability Conference	2017	Kaori Funatsu	Impact of sterilization on protein degradation in a polymer-base prefilled syringe	
Colorado Protein Stability Conference	2017	Cheng Her, Chris Sieracki, Kent Peterson, Christian Mills, John Carpenter	FlowCam Nano provides counts, sizes, and images of nano- and microparticles: Application to a therapeutic protein pumping study	

Colorado Protein Stability Conference	2017	Cheng Her	Analytical methods of particle formation during fill & finish operations	
Colorado Protein Stability Conference	2017	Christine Probst	Measurement of protein aggregates and silicone oil droplets using Amnis imaging flow cytometry	
Colorado Protein Stability Conference	2017	S. Shinoda	Influence of mechanical stress on SO-droplet formation in prefilled syringes	
Colorado Protein Stability Conference	2017	Lea Sorret	Adsorption of recombinant human interleukin-1 receptor antagonist to silicone oil-water interfaces leads to gel formation and subsequent surface-induced aggregation	
Colorado Protein Stability Conference	2017	Hao Wu	Extrinsic fluorescent dyes as tools to rapidly quantify protein particle concentrations	
Colorado Protein Stability Conference	2017	Hao Wu	Protein particle generation in fill-finish pumping operations	
Biotherapeutics Analytical Summit	2017	Yuanchun (Shirley) Zeng, Christine Probst, Kristina Cunningham	Characterizing mAb Aggregates by Orthogonal Methodologies	
	2015	Benjamin Spaulding, Aaron B. Krueger, John F. Carpenter	Utilization of a FlowCam to Detect and Image Particle Concentration Differences in Prefilled Syringes	
	2015	Lew Brown, Ben Spaulding	Glass Shard Detection in Protein Therapeutics Using Dynamic Imaging Particle Analysis	
Baxter Healthcare Corp	2014	Grant Woodard, Dr. Steve Nail	The Influence of Formulation and Processing Conditions on Subvisible Particles in a Model Freeze-Dried Protein	
Swiss Pharma Science Day	2014	Anacelia Rios Q, Christof Finkler, Hanns-Christian Mahler, Jorg Huwyler, Roland Schmidt, Atanas Koulov	Evaluation of Sub Visible Particle Counting Methods	
AAPS National Biotechnology Conference	2014	Lew Brown, William Bernt	The Importance of Thresholding in Imaging Analysis of Protein Aggregates	
BioProcess International	2013	Arleene C. Velayo, Rachel Emery, Danny Chou, Carolos Garcia, Charles Winter	Viral Filtration Performance and Overcoming Artifacts During Validation: A Case Study	
CHI PepTalk	2013	David Palmund, Damon Pawlak, Benjamin W. Spaulding, Josh Geib, Fatma AlAzzam	FlowCam Technology for Monitoring Particles in Protein Therapeutic Formulations	
Colorado Protein Stability Conference	2011	Kimberly J. Hassett, Megan Cousins, Pradyot Nandi, Robert N. Brey, John F. Carpenter, Theodore W. Randolph	Characterization of Particle Aggregation During Freeze Drying of Vaccines Containing an Aluminum Salt Adjuvant	
Conference Presentations		Authors	Presentation Title	
		Danny Chou	Protein Aggregation and Emerging Tools to Support Development and Characterization	
Patent Application	Volume	Date	Inventors	Title
<i>Specialty Carbon Black</i>		Dec. 2016	Kaur, Geoffrey Mcdermott	Mobile Solid Phase Compositions for Use in Biochemical Reactions and Analyses